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FOR THE COMPONENT S..(U) INFORMATION SPECTRUM INC
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UNCLASSIFIED F33600-82-C-0543 F/G 17/2 NL

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# VALIDATION OF THE ALGORITHM FOR BASE INSPECTION COSTS FOR THE COMPONENT SUPPORT COST SYSTEM (D160B)

Contract No. F33600-82-C-0543

15 Aug 1983

Report Number
V-83-31859-04



Submitted to:

HEADQUARTERS
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## EXECUTIVE SUMMARY

Visibility and Management of Operating and Support Costs is a program initiated by the Office of the Secretary of Defense (OSD) in order to ensure that each Military Department gathers, tracks, and computes operating and support costs by weapon system. VAMOSC II is an Air Force management information system which is responsive to the OSD initiative. It uses information from existing Air Force data systems to satisfy both Air Force and OSD needs for certain weapon system operating and support (O&S) costs.

At present, the VAMOSC II system comprises three subsystems:

(1) The Weapon System Support Cost (WSSC) system (D160), which deals with aircraft,

(2) The Communications - Electronics (C-E) system (D160A), which deals with ground communications - electronics equipment,

(3) The Component Support Cost Subsystem (CSCS) (D160B), which deals with subsystems and components for aircraft.

The Component Support Cost System (CSCS) of VAMOSC II gathers and computes support costs by assembly/subassembly and relates those costs back to the end item or weapon system. CSCS replaces the Logistic Support Cost (LSC) model of K051 (AFLCR 400-49) for aircraft and engines.

The CSCS receives inputs from 15 Air Force data systems. On a quarterly basis, the system provides two standard reports each processing cycle and twelve other types of reports as requested by users. It also provides pre-programmed data base extracts on

magnetic tape on a one-time basis in response to user requests. Special requests for data in user selected format may also be satisfied on a case by case basis.

At the heart of the CSCS is a set of 30 algorithms for estimation or allocation of costs. Information Spectrum, Inc. (ISI) was awarded a contract to validate these algorithms. This effort included investigations of logic, appropriateness of the algorithms and assumptions inherent in the algorithms. ISI was also to survey published findings, reports of audit, etc. relating to the accuracy of the source data systems. In addition to the algorithm validation, ISI was to perform certain "special tasks," including a user survey.

This report provides the verification and validation of the algorithm called "Base Inspection Costs." The costs of base inspection are the sum of direct labor costs expended in performing inspections and an allocated portion of base maintenance overhead costs.

The direct labor hours for inspections are calculated by summing all labor hours for Work Unit Codes (WUC) 03 and 04 for each MDS at each base. These labor hours are then multiplied by a cost which is the sum of the Direct Labor Rate for each MDS and the Overhead Cost Rate for each direct labor hour at each base. This produces an inspection cost for each MDS that includes overhead and is specific to each base.

In order to verify and validate the CSCS algorithms, a set of analysis procedures applicable to all of the algorithms was

established. These procedures were then applied to each algorithm. This report first describes the analysis procedures, without reference to the specific algorithm addressed by this report.

Next, the Base Inspection Cost algorithm is defined and described in detail. This description includes identification of source data systems and files, and the calculation procedures currently implemented by the CSCS.

Finally, a critique of the algorithm is provided as required by the contract. It addresses the following topics:

- o Verification of assumptions and approximations for appropriateness and accuracy.
- o Validation of accuracy of source data.
- o Validation of appropriateness of source data as inputs to CSCS logic.
- o Investigation of accuracy and appropriateness of algorithms.
- o Consideration of replacement of indirect cost methods with more direct ones.
- o Identification of algorithm impact on CSCS output reports.

For each algorithm addressed, ISI is required to affirm the process or procedure and reject any portion that cannot be affirmed. Where the algorithm or portion of the algorithm is rejected, an alternate procedure must be specified.

The following defects in the Base Inspection Cost algorithm have been noted.

(1) A military labor rate is multiplied by a sum of military and civilian labor hours.

(2) Annual inflation factors are applied once at the beginning of the fiscal year.

(3) Adjustment of labor rates on the basis of inflation factors becomes increasingly inaccurate as time elapses. No explicit provision is made for recognizing or correcting the inaccuracy.

In addition to these flaws, the report notes a problem in accuracy of input data systems. Published reports indicate that manhour data provided by the Maintenance Data Collection System is significantly deficient in both accuracy and timeliness. These deficiencies, if left uncorrected, would tend to negate the usefulness of the algorithm. However, the Air Force is currently testing a new system, the Automated Maintenance System, with considerable promise of correcting the deficiencies.

A simple adjustment procedure is recommended for changing annual inflation rates to values applicable to the quarter. This procedure would be manually implemented.

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## 1.0 INTRODUCTION

Visibility and Management of Operating and Support Costs is a program initiated by the Office of the Secretary of Defense (OSD) in order to ensure that each Military Department gathers, tracks, and computes operating and support costs by weapon system (all costs are computed and portrayed in "then year" dollars). VAMOSC II is an Air Force management information system which is responsive to the OSD initiative. It uses information from existing Air Force systems to satisfy both Air Force and OSD needs for certain weapon system operating and support (O&S) costs.

At present, the VAMOSC II system comprises three subsystems:

(1) The Weapon System Support Cost (WSSC) system (D160), which deals with aircraft,

(2) The Communications - Electronics (C-E) system (D160A), which deals with ground communications - electronics equipment,

(3) The Component Support Cost Subsystem (CSCS) (D160B), which deals with subsystems and components for aircraft.

### 1.1 The Component Support Cost System

The Component Support Cost System (CSCS) of VAMOSC II gathers and computes support costs by assembly/subassembly and relates those costs back to the end item or weapon system. CSCS replaces the Logistic Support Cost (LSC) model of K051 (AFLCR 400-49) for aircraft and engines.

The objectives of the Component Support Cost System are:

(1) To improve the visibility of aircraft and engine component support costs and to relate those costs to the end item or weapon system.

(2) To improve the Life Cycle Costing capability for the Air Force and the Department of Defense in the acquisition of new weapon systems.

(3) To assist in the design of new weapon systems by providing cost information on existing weapon systems thereby enhancing design tradeoff studies.

(4) To provide historical cost information at the weapon system level to improve logistic policy decisions.

(5) To identify system component reliability, effectiveness, and costs so that high support cost items may be identified and addressed.

The CSCS is described in detail in references [1], [2], and [3]. It receives inputs from 15 Air Force data systems. On a quarterly basis, the system provides two mandatory reports each processing cycle and twelve other types of reports as requested by users. It also provides pre-programmed data base extracts on magnetic tape on a one-time basis in response to user requests. Special requests for data in user selected format may also be satisfied on a case by case basis.

The twelve reports mentioned above are of primary interest to the user community. They are identified by name in Table 1. Descriptions and samples are provided by reference [1].

TABLE 1. CSCS OUTPUT REPORTS

| Number* | Name |
|---|---|
| 8105 | Cost Factors |
| 8104 | MDS Logistics Support Costs |
| 8106 | Base Work Unit Code (WUC) Costs |
| 8107 | Total Base Work Unit Code (WUC) Costs |
| 8111 | Depot On-Equipment Work Unit Code (WUC) Costs |
| 8108 | Total Base and Depot Work Unit Code (WUC) Costs |
| 8109 | NSN-MDS-WUC Cross-Reference |
| 8110 | MDS-WUC-NSN Cross-Reference |
| 8112 | Logistic Support Cost Ranking, Selected Items |
| 8113 | Summary of Cost Elements |
| 8114 | NSN-WUC Logistics Support Costs |
| 8115 | Assembly-Subassembly WUC Costs |

* CSCS output reports are assigned Report Control symbol HAF-LEY(AR)nnnn, where nnnn is the number in the table.

At the heart of the CSCS is a set of 30 algorithms for estimation or allocation of costs. The algorithms are identified by name in Table 2. Information Spectrum, Inc. (ISI) was awarded a contract to validate these algorithms. This effort included investigations of logic, appropriateness of the algorithms and assumptions inherent in the algorithms. ISI was also to survey published findings, reports of audit, etc. relating to the accuracy of the source data systems. In addition to the algorithm validation, ISI was to perform certain "special tasks," including a user survey.

## 1.2 Overview of the Algorithm

This report provides the verification and validation of the algorithm 5 of Table 2, "Base Inspection Costs." The algorithm calculates the combined costs of direct labor for aircraft inspection and the associated overhead. These costs are developed for each combination of aircraft MDS and base.

The algorithm combines methods which have previously been reported on. The direct labor cost is calculated in exactly the same way as was done for base TCTO labor in reference [17] except that manhours for WUC 03 and 04 are summed for each aircraft. The overhead cost is calculated in exactly the same way as was done for base TCTO overhead in reference [27]. However labor and overhead rates are combined to provide a cost for base inspection that includes both labor and overhead.

TABLE 2. CSCS ALGORITHM NAMES

1. Base TCTO Labor Cost
2. Base TCTO Overhead Cost
3. Base TCTO Material Cost
4. TCTO Transportation Costs
5. Base Inspection Costs
6. Base Other Support General Costs
7. Base Labor Costs
8. Base Direct Material Costs
9. Base Maintenance Overhead Costs
10. Second Destination Transportation Costs
11. Second Destination Transportation Costs (Engine)
12. Base Exchangeable Repair Costs (NSN)
13. Base Exchangeable Repair Costs (Engine)
14. Base Exchangeable Modification Costs (NSN)
15. Base Condemnation Spares Costs/NSN
16. Base Exchangeable Modification Costs (Engine)
17. Base Supply Management Overhead Costs
18. Depot TCTO Labor Costs
19. Depot TCTO Material Costs
20. Depot TCTO Other Costs
21. Depot Support General Costs
22. Depot Labor Costs
23. Depot Direct Material Costs
24. Depot Other Costs
25. Depot Exchangeable Repair Costs (NSN)
26. Depot Exchangeable Repair Costs (Engine)
27. Depot Exchangeable Modification Costs (NSN)
28. Depot Exchangeable Modification Costs (Engine)
29. Depot Condemnation Spares Costs (NSN)
30. Depot Material Management Overhead Cost

## 2.0 ANALYSIS PROCEDURES

In order to verify and validate the CSCS algorithms, a set of analysis procedures applicable to all of the algorithms was established. These procedures were then applied to each algorithm. This section describes the analysis procedures, without reference to the specific algorithm addressed by this report.

The algorithm analysis process consists of six portions, described in the following sections.

### 2.1 Algorithm Description

The algorithms are described in references [1], [2], and [3]. These descriptions are not identical. In general they supplement, rather than contradict each other. The first two describe what the system is to achieve; the third describes the system design to do so.

None of these decriptions provides the combination of level of detail and clarity of concept required for this validation effort. The first step in the analysis methodology was the generation of such a description. The descriptions in the three reference sources just cited were made explicit. When necessary, Air Force personnel involved in implementation of the D160B subsystem were contacted for clarification.

### 2.2 Input Data Definitions

Closely related to the first step was the clarification of the definitions of the input data. The identification of each

input data element and of the system providing it was provided by the User's Manual (reference [1]). This identification was refined by identification of a particular file within the source system and the structure of the file as described in both the CSCS System/Subsystem Specification and in the Memoranda of Agreement. The Memoranda of Agreement have been established between the Office of VAMOSC and the Offices of Primary Responsibility (OPR) for the systems providing the input data. Any inconsistencies or voids were identified and resolved through contact with the Office of VAMOSC and/or implementing personnel.

Whenever appropriate, input data element definitions were further refined by tracing the elements back to their sources through the reference data provided. If these were inadequate, the OPRs were contacted directly for clarifications. In tracing the data back to their origins, possible sources of data contamination were considered. Information on the likelihood and significance of such contamination was collected from cognizant personnel and from published references.

## 2.3 Concept Validation

The two steps above established exactly what the algorithm does. The third, and most critical step, considered the validity of the procedure. It depended on the ability of the analyst to translate mathematical formulas and data processing techniques into meaningful concepts.

Some explicit techniques which were generally used in concept validation are listed below.

(a) Consider how the cost element would be calculated if there were no constraints on resources. (For example, suppose the CSCS could identify the pay grade and hours worked of each individual involved in a maintenance action.)

(b) Identify assumptions* incorporated into the Algorithm. Generally this procedure will identify the real constraints which affect the approach in (a) above.

(c) Identify approximations incorporated into the algorithm. For instance, one such approximation is the use of an average labor rate for each aircraft.

(d) Study each approximation for possible sources of error. Some examples are biases introduced by editing procedures, obsolete data, or inappropriate application. Whenever feasible, estimate the likelihood of these errors by reviews of the literature and contact with cognizant personnel.

(e) Test the algorithms under conditions of assumed extreme values for the inputs. For instance, in evaluating the algorithm for base maintenance overhead costs, assume that for a single reporting period all maintenance labor is overhead and none is direct. Also try the reverse assumption. If an assumption of an extreme input leads to an illogical result, the algorithm is flawed.

Task 4 of Section C-2, of the contract speaks of appropriate statistical techniques to confirm or repu diate each algorithm. Statistical techniques could confirm or repudiate only statistical hypotheses as assumptions. (Use of an average does not constitute an assumption.) Accordingly, statistical techniques apply to confirmation or repudiation of an algorithm only to the extent that statistical hypotheses can be developed.

(f) As each algorithm is considered, ensure that the costs do not overlap others already accounted for. (In some cases an overlap may be necessary and desirable. where this occurs, the overlap will be noted.)

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* Note that assumptions, approximations, and allocations are different concepts, although in some cases the boundaries between them are not sharp. ISI has recognized few assumptions in the algorithms, but many approximations and allocations.

(g) In each CSCS output report, identify the data elements incorporating the output of the algorithm, so that a final assessment of report accuracy can be made for each output report.

(h) Consider alternative sources of input data for the algorithm. Also consider more direct cost assignments then those incorporated in the algorithm.

## 2.4 Problem Resolution

Whenever a significant deficiency was recognized in one of the algorithms, one or more proposed solutions were developed. This was a creative analytic process for which few guidelines could be proposed in advance. Certainly it depended on familiarity with the various existing Air Force data reporting and processing systems. Proposed solutions were discussed with personnel of the Office of VAMOSC, and revised as appropriate. Recommended solutions were expressed in the form of contributions to a draft Data Automation Requirement (DAR) when these would be applicable.

## 2.5 Documentation

The documentation of the analysis of each algorithm was a crucial part of the effort. Emphasis was placed on making it thorough, clear, and unambiguous. In the documentation, every assertion was substantiated. This was done by reference to source documentation, by explicitly expressed application of the experience and judgment of the contractor, or by citation of information provided by cognizant Air Force personnel. In the last case, the information was supported by documentation identifying the source, the date, and the information provided.

## 3.0 ALGORITHM ANALYSIS

The previous section described the general analysis procedures applied to all algorithms. This section presents the results of applying those procedures to the algorithm for Base Inspection Costs.

Section 3.1 provides a detailed description of the algorithm and of the input data it uses. Section 3.2 provides a critique, structured to correspond to the contractual requirements. Section 4.0 makes recommendations for solutions of problems.

### 3.1 Algorithm Description

In the following description COBOL-type data names are used to express the algorithm output and its components. The available source documentation does not provide the actual data names used by the CSCS programs. They are presumably different from those used in this report.

This description provides a formula for the calculation that is derived from the Users Manual and other sources. It is not the same as the formula provided in the Users Manual. It is intended to be more explicit. The formula is stated in Section 3.1.1. The input data elements and their sources are provided in Section 3.1.2. The calculation is described verbally in Section 3.1.3. Unless otherwise noted, the descriptions are based on references [1], [2], and [3], and on direct discussion with personnel of the Office of VAMOSC. In case of any discrepancies, information provided by knowledgeable personnel was accepted as most current, hence most definitive.

### 3.1.1 Calculations

MDS-BASE-INSP-COST = MDS-BASE-INSP-MH
x (DLR-MDS + BASE-MAINT-OVHD-COST-RATE)

### 3.1.2 Inputs

Name: MDS-BASE-INSP-MH

Definition: Inspection manhours reported for the MDS, base, and calendar quarter.

Source System/File: D056A/MNI75A0

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Name: DLR-MDS

Definition: Average direct military labor rate for maintenance for the MDS

Source System/File: Reference [7] provides average direct labor rates for FY 80 for each MDS. The military rates are inflated by the CSCS by multiplying by the inflation index for military manpower cost in year X (referenced to FY 80), published annually in AFR 173-13, where X is the fiscal year in which the quarter of interest falls. According to reference [1], rates will be re-calculated on an as required basis. No procedure has been established for determining when or how to recalculate the rates.

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Name: BASE-MAINT-OVHD-COST-RATE

Definition: The average quarterly cost of maintenance overhead associated with one hour of direct maintenance labor for the base.

Source: The Base Maintenance Overhead Cost Rate is calculated once each quarter for each base by the CSCS, and used in several algorithms. The calculation was described in reference [27].

### 3.1.3 Description of Calculation Procedure

D056A File MN175A0 is received monthly. Records include

SRD, base code, and "Support General - Inspection" manhours. The program recognizes engine SRDs, and identifies the engine inspection manhours to the associated aircraft MDS. For each MDS-base combination, the program adds inspection manhours reported directly for the MDS to inspection manhours reported for the engine. This MDS per base manhour total is multiplied by the sum of the Direct Labor Rate for the MDS and the Base Maintenance Overhead Cost Rate. The result is identified as the Base Inspection Cost for the MDS, base, and calendar quarter.

### 3.2 Critique of Algorithm

This section addresses various facets of the algorithm. The discussion is structured to correspond to the contractual requirements. Each aspect is either affirmed or rejected. Rejections lead to reecommendations in Section 4.0.

As noted in Section 1.2, this algorithm uses a combination of methods reviewed in reference [17]. The affirmations and rejections which were developed in that reference are repeated here, but the details are omitted where they would be too repetitious. For those details, the reference should be consulted.

#### 3.2.1 Appropriateness and Accuracy of Assumptions and Approximations.

Information Spectrum has identified two assumptions or approximations (either term is appropriate) implicit in the algorithm. The first is that average labor rates for inspection in 1980 were the same as the average for all maintenance in 1980. The second is that the rate of inflation for inspection labor is

the same as the rate applicable to military manpower cost in general.

Addressing the first assumption, reference [52], Chapter 2, Section D gives policy and procedures for the inspection function at squadron level. References to personnel skills, on-the-job training, and proficiency goals suggest that skill levels span the range found in maintenance in general. This argument, admittedly very indirect, suggests that inspection labor rates should lie near the average for an aircraft. The worldwide average labor rate per MDS is therefore appropriate. ISI can see no feasible approach to a more direct verification.

The second question is whether inflation factors for inspection labor rates might differ significantly from those for all military personnel. ISI analysts have tracked various inflation indices for many years. Our experience indicates that differences between indices for similar quantities are invariably negligible for periods of many years.

Accordingly, ISI affirms the appropriateness and accuracy of assumptions and approximations incorporated in this algorithm.

### 3.2.2 Accuracy of Source Data and Congruence of Data Element Definitions

Information Spectrum was directed to validate accuracy of source data based on a survey of published findings, reports of audit, etc. on source data systems. No direct sampling of data was to be performed. The Office of VAMOSC has indicated that direct validation of source data is planned for future efforts.

The source data consists of manhours provided by the Product Performance System (D056), labor rates for FY 80 provided on a one-time basis, inflation factors published annually by the Air Force and base maintenance overhead cost rates generated within the CSCS. For the first three items, the accuracy of the source data and the congruence of the data element definitions as used in the CSCS with the definitions in the source systems were discussed at length in previous reports, especially in Section 3.2.2 of reference [17]. The conclusions are summarized here. The discussion of the Base Maintenance Overhead Cost Rate is new.

On the basis of published reports, ISI concludes that manhours data provided by the D056 system is at present generally subject to significant deviations from that which actually occurs, with direct adverse impact on the output of the algorithm. However, the Air Force is currently developing a system, called the CORE Automated Maintenance System (CAMS), which holds promise of overcoming this problem. We find no lack of congruence between the definitions of inspection manhours as used by the base Inspection Costs algorithm and as provided by the input data system.

The algorithm is based on military labor rates established for 1980. The accuracy and repeatability of these labor rates will be addressed in subsequent reports. The algorithm applies labor rates to manhours which are the sum of military and civilian maintenance manhours. The rate applied, however, is the military labor rate. The civilian rates are not used. This lack

of congruence distorts the algorithm results.

We affirm the accuracy of the inflation factors used by the CSCS. However, as discussed in Section 3.2.2.4 of reference [17], the use of the same annual inflation factor in each quarter of a fiscal year represents a lack of congruence between the definitions of this factor as used by the CSCS and as defined by the input data system. The lack of congruence may introduce distortions in the results which ISI considers unacceptable.

The Base Maintenance Overhead Cost Rate, although treated as an input to this algorithm, is developed within the CSCS itself. It was reviewed in detail in reference [27]. That review affirmed the actual programmed procedure for developing the Base Maintenance Overhead Cost Rate. The procedure as described in in the Users manual and Functional description is flawed and re-writes of appropriate sections of those documents are required.

The definition of the Base Maintenance Overhead Cost Rate was also discussed in reference [27] and is applicable to all types of base maintenance. Therefore, its use in the algorithm for Base Inspection Costs is congruent with the definition provided by the input data system, which is the CSCS itself.

### 3.2.3 Appropriateness of Source Data as Inputs

The algorithm uses manhours data, Direct Labor Rates, and the Base Maintenance Overhead Cost Rate. These are addressed separately in the following subsections.

#### 3.2.3.1 Manhours Data

The need for manhours data as inputs to this algorithm is

self-evident. The D056 data accurately reflects the data logged by maintenance personnel. No other source of manhours data exists. Accordingly, ISI affirms the use of the D056 data as a source of manhours. It must be recognized, however, that improvement in source data accuracy is highly desirable, as discussed in Section 3.2.2.

3.2.3.2. Labor Rate

The appropriateness of the average worldwide labor rates by MDS as adjusted by inflation is adequate at present, but these values will deteriorate as time goes by. The labor rates represent a mix of pay grades valid in 1980. This mix will lose validity as the Air Force manpower mix changes with time. The assertion of reference [1] that the labor rates will be recalculated "on an as required basis" is not sufficient assurance that it will actually occur. Initial investigation indicates that the direct labor rates by MDS provided by reference [16] cannot be recalculated with ease. Accordingly, ISI finds this input inappropriate until further investigation in the review of other algorithms establishes the appropriateness of the rate.

3.2.3.3. Base Maintenance Overhead Cost Rate

Since the CSCS itself is the source of this rate, it is *ipso facto* an appropriate data source.

3.2.4. Accuracy and Appropriateness of the Algorithm

This algorithm calculates Base Inspection Costs as the sum of two components. One is the base inspection direct labor costs,

calculated exactly as in reference [17]. As in reference [17], ISI affirms the accuracy and appropriateness of this part of the algorithm, subject to the criticisms in Section 3.2.2 and 3.2.3.

The second component is the base inspection overhead costs, calculated using the base overhead cost rate that is analyzed in reference [27] and the base inspection manhours. As in reference [27], ISI affirms the accuracy and appropriateness of this part of the algorithm.

### 3.2.5 Directness of Costing

This algorithm, provides a direct costing methodology and a more direct costing methodology is neither possible nor necessary.

### 3.2.6 Application to CSCS Output Reports

Base inspection costs and the elements which are included in the algorithm are components of five CSCS reports, as described by Table 3. Each of the individual cost elements of each output report that are impacted by the algorithm are indicated by an asterisk in Table 3. The accuracy and limitations declared for the algorithm and its elements by this report impacts these output report elements. The total accuracy of each output report cannot be addressed until all algorithms impacting the report and its respective cost elements have been reviewed. This will occur in the final report of this effort.

Evaluation of the usefulness of the report will also be provided in the final report of this effort and after ISI conducts a survey of users.

TABLE 3

CONTRIBUTION OF BASE INSPECTION
COST ALGORITHM TO CSCS OUTPUT REPORTS
(*INDICATES REPORT COST ELEMENT)

| OUTPUT REPORT# | COST ELEMENTS CONTRIBUTED TO BY THE ALGORITHM |
|---|---|
| 1. MDS Logistics Support Costs/8104 | 1. Elements by total Airframe MDS<br>a. Support General Costs<br>(1) Base<br>*(a) Inspection Costs<br>*(b) Inspection Hours<br>b. Total MDS Costs |
| 2. Base WUC Costs/8106 | 2. Elements by MDS and by Base<br>a. Total Base Costs<br>* (1) Support General |
| 3. Total Base WUC Costs/8107 | 3. Elements by MDS for <u>All</u> Bases<br>a. Total Base Costs<br>* (1) Support General |
| 4. Total Base and Depot WUC Costs/8108 | 4. Elements by MDS<br>a. Total Costs<br>* (1) Support General |
| 5. Summary of Cost Elements/8113 | 5. Elements by MDS Total Air Force<br>a. Unit Mission Personnel (Maintenance)<br>(1) Organizational Costs<br>* (a) Base Support General |

# CSCS output reports are assigned Report Control Symbol HAF-LEY (AR) nnnn, where nnnn is the number indicated in the output report title in Table 3.

## 4.0 RECOMMENDATIONS

Section 3 has presented ISI's judgement that the algorithm for base inspection costs is fundamentally sound. It shares the flaws identified in reference [17], except that, as indicated in Section 3.2.2, direct labor for inspection is not affected by the problem with civilian hours. The other recommendations from reference [17] are summarized below.

The treatment of labor rates in the algorithm contains the following flaws:

(1) Annual inflation factors are applied once at the beginning of the fiscal year.

(2) Adjustment of labor rates on the basis of inflation factors alone becomes increasingly inaccurate as time elapses. No explicit provision is made for recognizing or correcting the inaccuracy.

References [17] and [27] recommend that a linear interpolation be applied to annual inflation factors in order to generate values applicable to each fiscal quarter. The recommended interpolation formulas are provided in those references; they would be redundant here.

### 4.0a Office of VAMOSC (OOV) Comments

Concur.

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[4] TO-00-20-2, Technical Manual: The Maintenance Data Collection System, 1 November 1981

[5] TO-00-20-2-45-2, Operational Supplement to Technical Order: Maintenance Documentation for In-Shop Engine Maintenance, 1 October 1982

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[21] TO-00-20-2-2, Technical Manual: On-Equipment Maintenance Documentation for Aircraft; Air-Launched Missiles; Ground-Launched Missiles; Except ICBMS; Drones; and Related Training Equipment, 1 August 1976, updated to 15 October 1982

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MEMORANDA OF AGREEMENT
FOR SYSTEM INTERFACES

| Ref. No. | Memorandum No. | Date |
|---|---|---|
| [6.1] | D002A/M024B/D160B-A | 9 Jun 1980 |
| [6.2] | D002A/M024B/D160B-B | 9 Jun 1980 |
| [6.3] | D024A/D160B-A | 30 Jun 1980 |
| [6.4] | D033./ARC/D160B | 14 Jun 1980 |
| [6.5] | D042A/DNB/D160B | 4 Nov 1983 |
| [6.6] | D046/M024/D160B | 9 Apr 1981 |
| [6.7] | D046/D160B | 23 Jun 1982 |
| [6.8] | D056A/BDN/D160B-A | 23 Jan 1981 |
| [6.9] | D056A/D160B-C | 13 Oct 1981 |
| [6.10] | D056A/D160B-D | 29 Jan 1981 |
| [6.11] | D056A F005 | 25 Apr 1979 |
| [6.12] | D056B/BDN/D160B-A | 22 Dec 1980 |
| [6.13] | D056C/D160B-A | 4 Mar 1981 |
| [6.14] | D071/D160B | 17 Jun 1982 |
| [6.15] | D143B/D002A 9159 | 3 Aug 1979 |
| [6.16] | D143F/ARC/D160B-A | 5 Feb 1981 |
| [6.17] | D160/D160B | 11 Jun 1982 |
| [6.18] | G004L/M024B/D160B-A | 30 May 1980 |
| [6.19] | G004L/M024B/D160B-B | 30 May 1980 |
| [6.20] | G004L/M024B/D160B-C | 5 Nov 1981 |
| [6.21] | G019F/D160B | 8 Sep 1982 |
| [6.22] | G033B/D160B | 12 Jul 1982 |
| [6.23] | G072D/BDN/D160B-A | 19 Apr 1982 |

MEMORANDA OF AGREEMENT
FOR SYSTEM INTERFACES (Continued)

| Ref. No. | Memorandum No. | Date |
|---|---|---|
| [6.24] | H036B/RC/D160B-A | 10 Feb 1981 |
| [6.25] | H069R/M024B/D160B-B | 19 Jan 1981 |
| [6.26] | O013/BDN/D160B | 22 Jul 1982 |

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER | 2. GOVT ACCESSION NO. AD-A156 633 | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle) Validation of the Algorithm for Base Inspection Costs for THE CSCS (D160B) | | 5. TYPE OF REPORT & PERIOD COVERED Technical Report |
| | | 6. PERFORMING ORG. REPORT NUMBER V-83-31859-04 |
| 7. AUTHOR(s) Dr. Sheldon J. Einhorn | | 8. CONTRACT OR GRANT NUMBER(s) F33600-82-C-0543 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS Information Spectrum, Inc 1745 S. Jefferson Davis Highway Arlington, VA 22202 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS HQ AFLC/MML(VAMOSC) Wright-Patterson AFB, OH 45433 | | 12. REPORT DATE August 1983 |
| | | 13. NUMBER OF PAGES 34 |
| 14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) | | 15. SECURITY CLASS. (of this report) Unclassified |
| | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

VAMOSC

O&S Costs

Cost Allocation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is the fourth of a set of reports documenting the findings of a study conducted by Information Spectrum, Inc (ISI) for the Office of VAMOSC, Air Force Logistics Command. This study constitutes an assessment of the algorithm for the Base Inspection Costs within the Component Support Cost System (CSCS) subsystem of VAMOSC, The Air Force Visibility and Management of Operating and Support Cost system. CSCS deals with subsystems and components for aircraft.

20. This report provides the verification and validation of the algorithm called "Base Inspection Costs". The costs of base inspection are the sum of direct labor costs expended in performing inspections and in allocated portion of base maintenance overhead costs.

This volume presents ISIs conclusions and recommendations, and the comments of the Office Of VAMOSC.

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